



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,662	07/10/2003	Peng Zhang	06293P2 USA	6920

23543 7590 09/12/2005

AIR PRODUCTS AND CHEMICALS, INC.
PATENT DEPARTMENT
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 181951501

EXAMINER

WEBB, GREGORY E

ART UNIT	PAPER NUMBER
----------	--------------

1751

DATE MAILED: 09/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/616,662

Applicant(s)

ZHANG ET AL.

Examiner

Gregory E. Webb

Art Unit

1751

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-58 is/are pending in the application.
- 4a) Of the above claim(s) 1-30 and 45-58 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☐ Claim(s) 31-44 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) 7/10/03
Paper No(s)/Mail Date ____ Signed 1/26/05, 9/1/04, 2/2/04
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 31-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Honda (US 5,977,041). Concerning the semiconductor manufacturing and the claimed substrate, Honda teaches the following:

The manufacture of semiconductor components and integrated circuits is

Art Unit: 1751

generally carried out using photolithographic processes. These processes involve first coating the semiconductor substrates with photoresist (positive or negative) to form a photoresist layer thereon, followed by imagewise exposing and subsequent developing to form a patterned photoresist layer on the substrate. This patterned layer acts as a mask for actual substrate patterning processes such as etching, doping, coating with metals or other semiconductor materials or other insulating materials.(see col. 1, lines 20-30)

Concerning the claimed acetylenic diol surfactant, Honda teaches the following:

A post-strip rinse solution made from 99.8 grams water, 0.1 grams lactic acid, and 0.1 grams SURFYNOL 420 obtained from Air Products, Inc. This solution had a pH of about 2.9 at 25.degree. C.(see example 1)

Concerning the claimed formula VI surfactant and the claimed aqueous solvent, Honda teaches the following:

When a liquid photoresist stripper solution or an oxygen gas plasma ashing step is used to remove the patterned photoresist layer, it is common to employ a subsequent liquid rinse operation. Generally, this rinse treatment involves first rinsing the substrate with an organic solvent (e.g., most commonly isopropyl alcohol) followed by a second rinsing operation with deionized water. Besides isopropyl alcohol, specific teachings of alternative organic solvent rinse solutions are described in U.S. Pat. Nos. 4,786,578 (Neisius et al.)(an organic base such as

Art Unit: 1751

triethanolamine in combination with a non-ionic surfactant); 4,824,762 (Kobayashi et al.) (an ether compound such as dipropylene glycol monomethyl ether and optionally, an amine compound such as monoethanolamine); and 5,174,816 (Aoyama et al.) (an aqueous solution of a quaternary ammonium hydroxide in combination with a sugar or sugar alcohol). However, the use of such organic solvent-containing rinses are not necessarily desirable because they add complexity to the photoresist removal operation and generate additional solvent waste. (see cols. 1-2)

Concerning the claimed additives and the photoactive compound, Honda teaches the following:

8. The aqueous rinsing composition of claim 1 further comprising the addition of optional additives selected from the group consisting of colorants, wetting agents, antifoamers, and combinations thereof. (see claim 8)

Concerning the claimed rinsing step and the claimed rinsing step, Honda teaches the following:

(3) rinsing said substrate with an aqueous rinse solution comprising water, at least one water-soluble organic acid, and at least one water-soluble surface-active agent, said rinse solution having a pH in the range from about 2.0 to about 5.0. (see col. 3, lines 15-25)

Concerning the claimed solvent, Honda teaches the following:

3. The aqueous rinsing composition of claim 2, wherein said acetylenic alcohol groups of said oligo(ethylene oxide) compound containing at least one acetylenic alcohol group are selected from the group consisting essentially of 3-methyl-1-butyn-3-ol, 3-methyl-1-pentyn-3-ol,

Art Unit: 1751

2,5-dimethyl-3-hexyn-2,5-diol, 3,6-dimethyl-4-octyn-3,6-diol,
2,4,7,9-tetramethyl-5-decyn-4,7-diol, 3,5 -dimethyl-1-hexyn-3-ol, and
combinations thereof.(see claim 3)

Claims 31-44 are rejected under 35 U.S.C. 102(e) as being anticipated by Lachowski
(US6670107).

Concerning the claimed intended use, Lachowski teaches the following:

Disclosed are methods for the reduction of defects during the manufacture
of electronic devices. Also disclosed are electronic devices having
reduced numbers of defects.(see abstract)

Concerning the semiconductor manufacturing, Lachowski teaches the following:

Two surfactant solutions were prepared. Sample A contained 25 ppm of a
commercially available EO/PO copolymer nonionic surfactant in DI water.
Sample B contained 50 ppm of the same surfactant as Sample A in DI water.
A series of test wafers containing a photoresist layer that had been
exposed were developed using standard methods. Following development, a
portion of the wafers were rinsed using Sample A and a portion of the
wafers were rinsed using Sample B. Following rinsing with Samples A or B,
the wafers were dried by spin drying at two speeds. The slow spin dry
speed was 500 RPM and the fast spin dry speed was 5000 RPM. After drying,
defect maps of the test wafers were prepared using a Tencor defect scan

Art Unit: 1751

and standard techniques. The sum of all defects are reported in Table 1 as an average of duplicate experiments. The control sample was a wafer coated with a photoresist layer that was not exposed, but was developed in the same manner as the test wafers and was then rinsed with DI water and spin dried at only 4000 RPM. The defect scan of the control sample stopped counting defects when approximately 75% of the wafer had been scanned as the number of defects surpassed a preset maximum.(see example 1)

Concerning the claimed formula VI surfactant, Lachowski teaches the following:

Following exposure, the film layer of the photoresist composition is preferably baked at temperatures ranging from about 70.degree. C. to 160.degree. C. Thereafter, the film is developed. The exposed resist film is rendered positive working by employing a polar developer, typically an aqueous based developer, such as quaternary ammonium hydroxide solutions, such as tetra-alkyl ammonium hydroxide, preferably a 0.26 N tetramethylammonium hydroxide; various amine solutions, such as ethylamine, n-propylamine, diethylamine, triethylamine or methyl diethylamine; alcohol amines, such as diethanolamine, triethanolamine; cyclic amines, such as pyrrole, pyridine, and the like.(see col. 1, lines 35-47)

Concerning the claimed rinsing step and the claimed rinsing step, Lachowski teaches the following:

The procedure of Example 1 was repeated except that after development, the test wafers were rinsed with DI water prior to rinsing with Samples A or

B. The results are reported in Table 2.(see example 2)

Concerning the claimed solvent and the claimed aqueous solvent, Lachowski teaches the following:

Any solvent which is water miscible and is compatible with the one or more surfactants is suitable for use in the present invention. Suitable cosolvents useful in the present invention include, but are not limited to, (C.sub.1 -C.sub.20)alkanediols such as ethylene glycol, diethylene glycol, propylene glycol, 2-methylpropanediol and dipropylene glycol; (C.sub.1 -C.sub.20)alkanediol (C.sub.1 -C.sub.6)alkyl ethers such as propylene glycol monomethyl ether, propylene glycol dimethyl ether, propylene glycol n-butyl ether, dipropylene glycol monomethyl ether, dipropylene glycol dimethyl ether, dipropylene glycol monobutyl ether, tripropylene glycol monomethyl ether and propylene glycol methyl ether acetate; aminoalcohols such as aminoethylaminoethanol; N-(C.sub.1 -C.sub.10)alkylpyrrolidones such as N-methylpyrrolidone, N-ethylpyrrolidone, N-hydroxyethylpyrrolidone and N-cyclohexylpyrrolidone; (C.sub.1 -C.sub.10)alcohols such as ethanol and iso-propanol; and the like. It is preferred that the cosolvent is one or more of (C.sub.1 -C.sub.20)alkanediols, (C.sub.1 -C.sub.20)alkanediol (C.sub.1 -C.sub.6)alkyl ethers and (C.sub.1 -C.sub.10)alcohols and more preferably one or more of propylene glycol monomethyl ether, propylene glycol dimethyl ether, propylene glycol n-butyl ether, dipropylene glycol

Art Unit: 1751

monomethyl ether, dipropylene glycol dimethyl ether, dipropyleneglycol n-butyl ether, tripropylene glycol monomethyl ether, propylene glycol methyl ether acetate ethanol and iso-propanol. Such cosolvents are generally commercially available from a variety of sources, such as Aldrich (Milwaukee, Wis.) and may be used without further purification.(see cols. 3-4)

Concerning the photoactive compound, Lachowski teaches the following:

A photoresist can be either positive-acting or negative-acting. For most negative-acting photoresists, those coating layer portions that are exposed to activating radiation polymerize or crosslink in a reaction between a photoactive compound and polymerizable agents of the photoresist composition. Consequently, the exposed coating portions are rendered less soluble in a developer solution than unexposed portions. For positive-acting photoresists, exposed portions are rendered more soluble in a developer solution while areas not exposed remain comparatively less developer soluble. In general, photoresist compositions include at least a resin binder component and a photoactive agent.(see col. 1, lines 23-35)

Concerning the claimed substrate, Lachowski teaches the following:

When the compositions of the present invention are used as a pre-wetting agent, the photoresist layer is contacted with the treatment solution of the present invention prior to being at least partially removed. By "at least partially removing" the photoresist is meant that a portion of the photoresist layer is removed. Such at least partial removal includes

Art Unit: 1751

development of the photoresist where only exposed or unexposed portions of the photoresist are removed as well as stripping where substantially all of the photoresist layer is removed.(see col. 4, lines 33-42)

Claims 31-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Lassila (US6455234).

Concerning the claimed intended use, Lassila teaches the following:

an ability to provide a reduction in coating or printing defects such as orange peel and flow/leveling deficiencies;(see col. 7, lines 35-60)

Concerning the semiconductor manufacturing and the claimed substrate, Lassila teaches the following:

an ability to formulate low surface tension aqueous electronics cleaning and processing solutions, including photoresist developer solutions, for the semiconductor manufacturing industry with good wetting and extremely low foam; and(see col. 7, lines 35-60) ,

Concerning the claimed acetylenic diol surfactant and the claimed solvent, Lassila teaches the following:

18. The process of claim 16 in which the acetylenic diol moiety of the acetylenic diol ethylene oxide/propylene oxide adduct is derived from 2,5,8,11-tetramethyl-6-dodecyne-5,8-diol.(see claim 18)

Concerning the claimed formula VI surfactant, Lassila teaches the following:

U.S. Pat. No. 5,756,267 discloses developing solutions useful in the

Art Unit: 1751

manufacture of liquid crystal displays. These solutions contain water, a quaternary ammonium base such as TMAH, a quaternary ammonium salt surface active agent, an alkanolamine and an acetylenic alcohol based surface active agent which is the same as those disclosed by the '067 patent.(see col. 6, lines 13-20)

Concerning the claimed dispersant, Lassila teaches the following:

Traditional nonionic surfactants such as alkylphenol or alcohol ethoxylates, and ethylene oxide (EO)/propylene oxide (PO) copolymers have excellent equilibrium surface tension performance but are generally characterized as having poor dynamic surface tension reduction. In contrast, certain anionic surfactants such as sodium dialkyl sulfosuccinates can provide good dynamic results, but these are very foamy and impart water sensitivity to the finished coating.(see col. 1, lines 40-53)

Concerning the claimed additives, Lassila teaches the following:

where $R = C_{1-8}$ alkyl; $m+n = \text{integer } 1 \text{ to } 100$. These compounds are prepared by reacting acetylenic glycols and propylene oxide in the presence of Lewis acid catalysts such as BF_3 . It is stated that amine catalysts are inactive for the addition of propylene oxide to acetylenic diols. The propylene oxide adducts are said to be useful as wettability improvers for antitrust oil, antifoamers, spreaders for pesticides, and wetting agents for adhesives. They are effective in improving wettability of oils and have improved antifoaming ability.(see col. 4, lines 1-25)

Art Unit: 1751

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325.

The examiner can normally be reached on 9:00-17:30 (m-f).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Gregory E. Webb
Primary Examiner
Art Unit 1751

gew